



Associated
Engineering



Platinum
member



ENMAX DISTRICT ENERGY

Combined Heat & Power Project

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Introduction



While we're known for electricity, our District Energy System is just one example of the many ways we safely and reliably deliver energy to Alberta homes and businesses.



GENERATION



SOLAR



WIND

ENMAX DISTRICT ENERGY

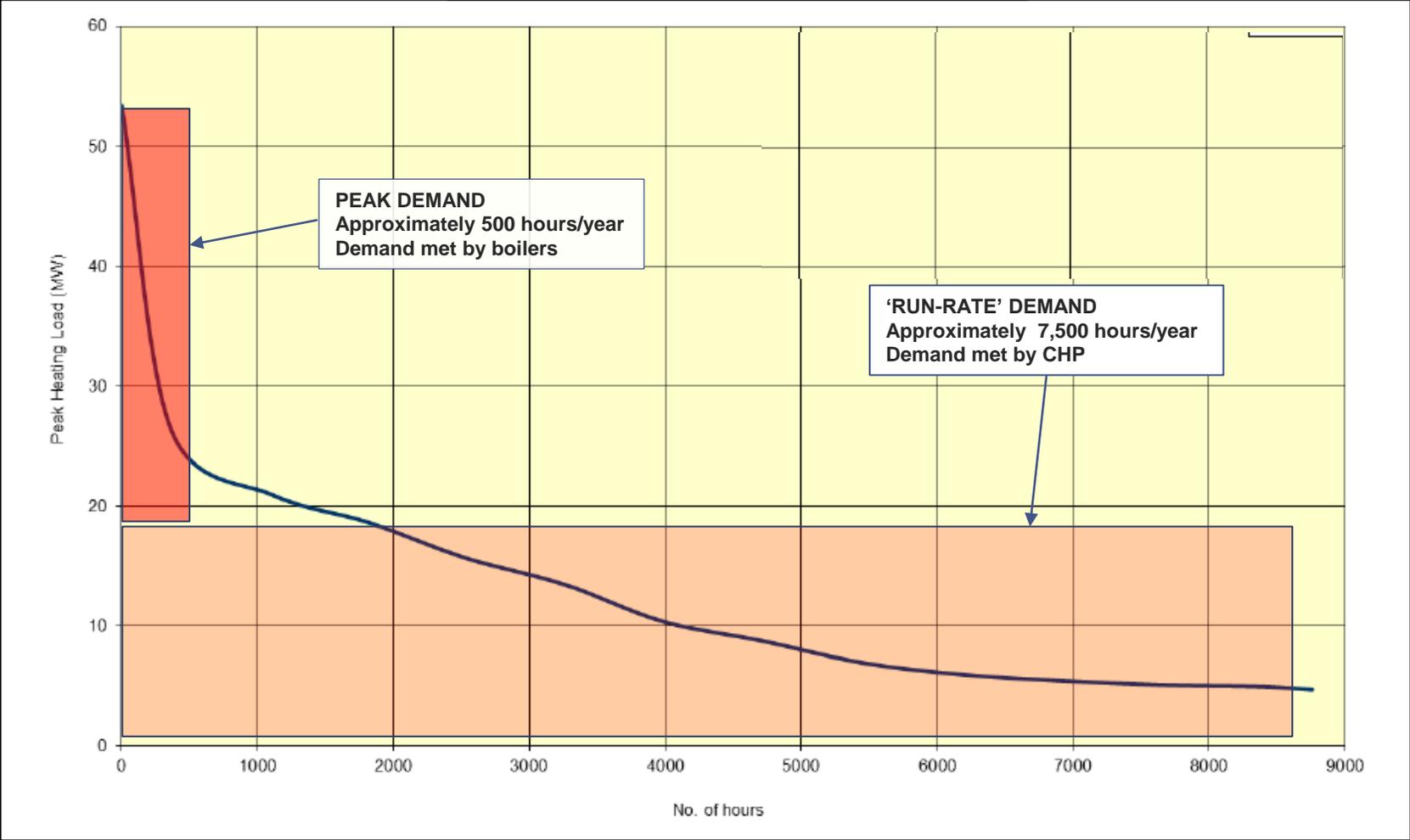
- COMMISSIONED IN 2010
- 20,000 FT² FACILITY
- 100 MWt CAPACITY
- +5M FT² CONNECTED
- 5500 METERS OF PIPELINE
- OVER 50% TO CAPACITY
- ONLY PRIVATE DE SYSTEM IN ALBERTA



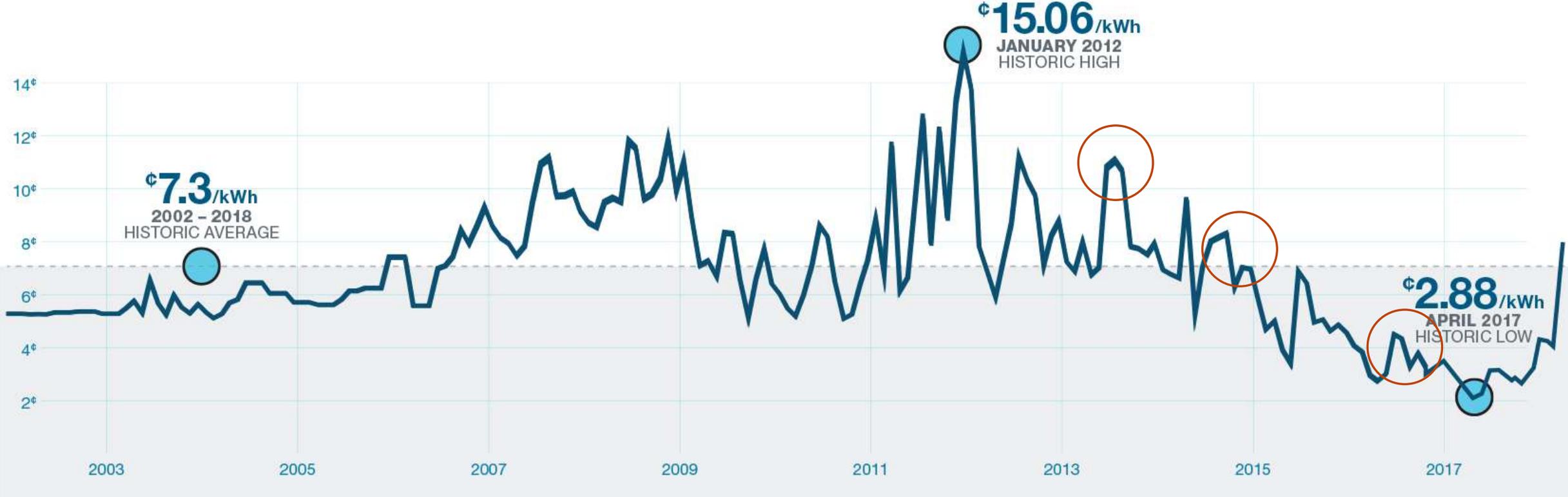
Let's make heat and power at the ENMAX District Energy Centre

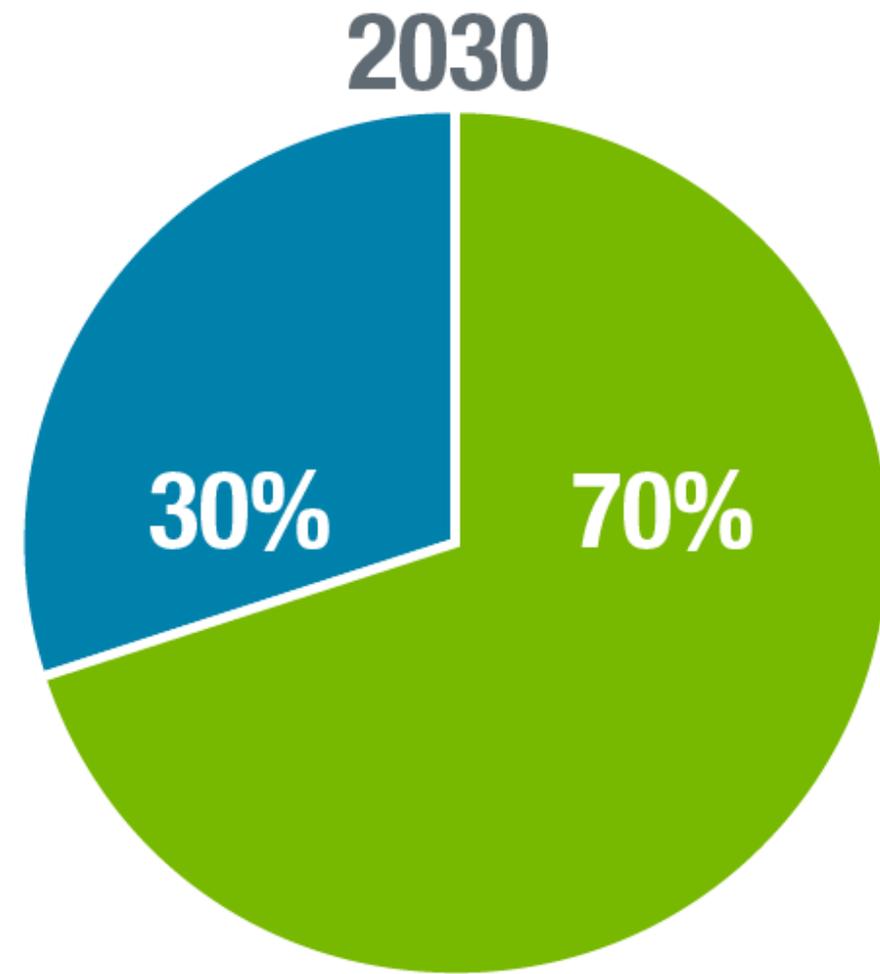
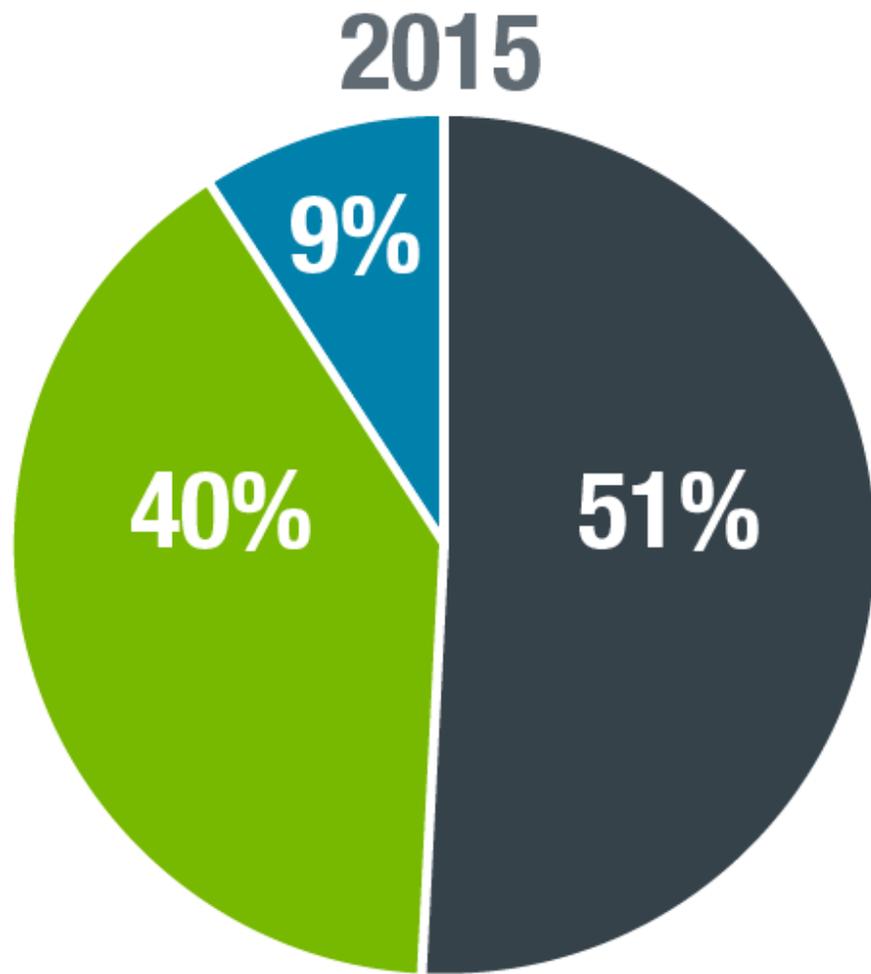
HOW DID WE GET TO “YES”?

LOAD DURATION CURVE



Alberta Average Regulated Rate Option: 2002-Present (C/KWH)





 Renewables

 Natural Gas

 Coal

HISTORICAL OIL PRICES

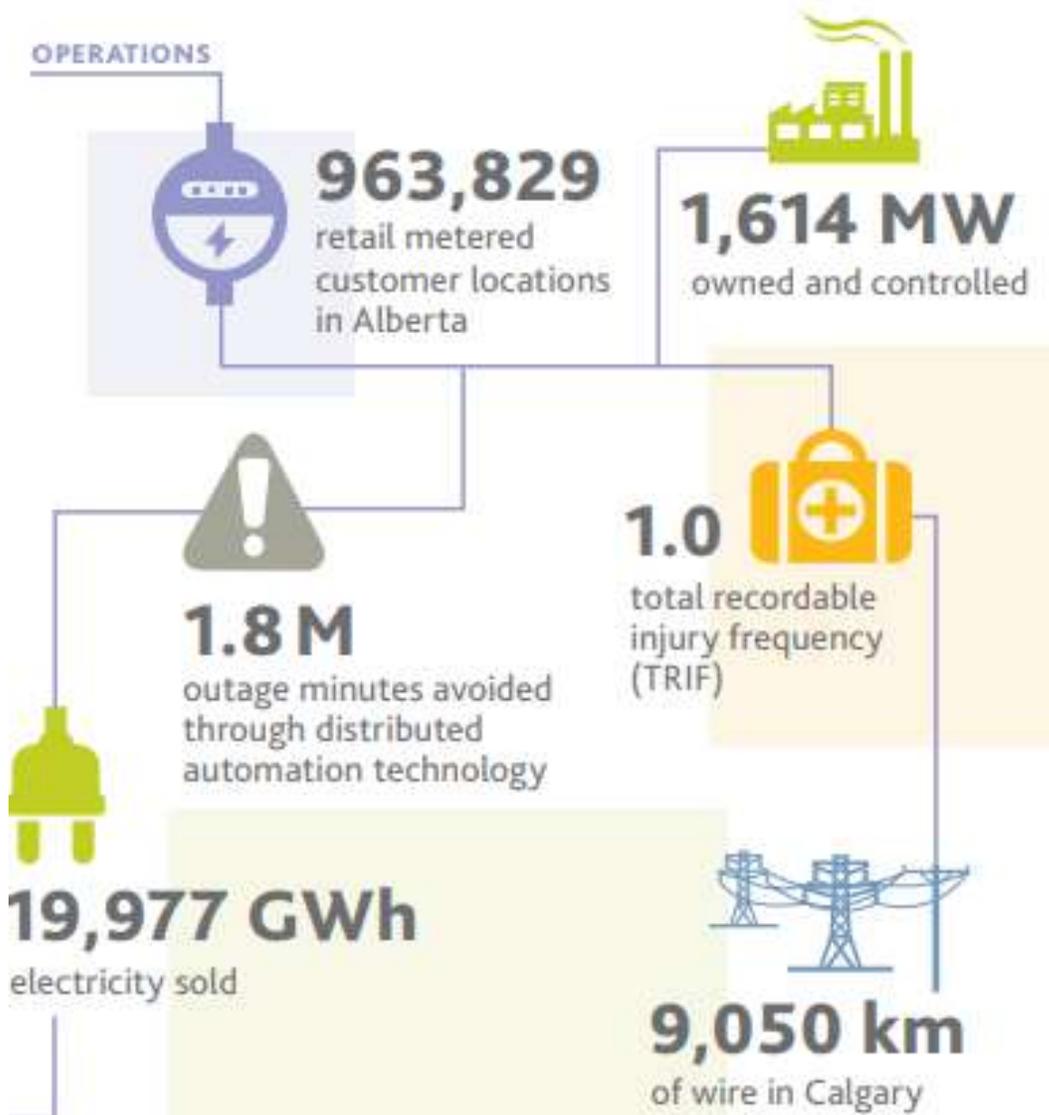
Nov 2011 to Mar 2018

1 year 5 year 10 year All available





OPERATIONS



FINANCIALS

\$40 M

dividend declared to The City of Calgary

\$412.8 M

in earnings before interest taxes, depreciation and amortization (EBITDA)



\$290 M

invested in Calgary's transmission and distribution system and other assets

\$5.6 B

total assets

\$132 M

net earnings from continued operations



ENVIRONMENT

50%

of Alberta's grid-connected rooftop solar installed through ENMAX Energy





**~78% OF CHP REVENUE
FROM ELECTRICITY SALES**

**~22% OF CHP REVENUE
FROM THERMAL SALES**

CHP ENTITY



DE ENTITY

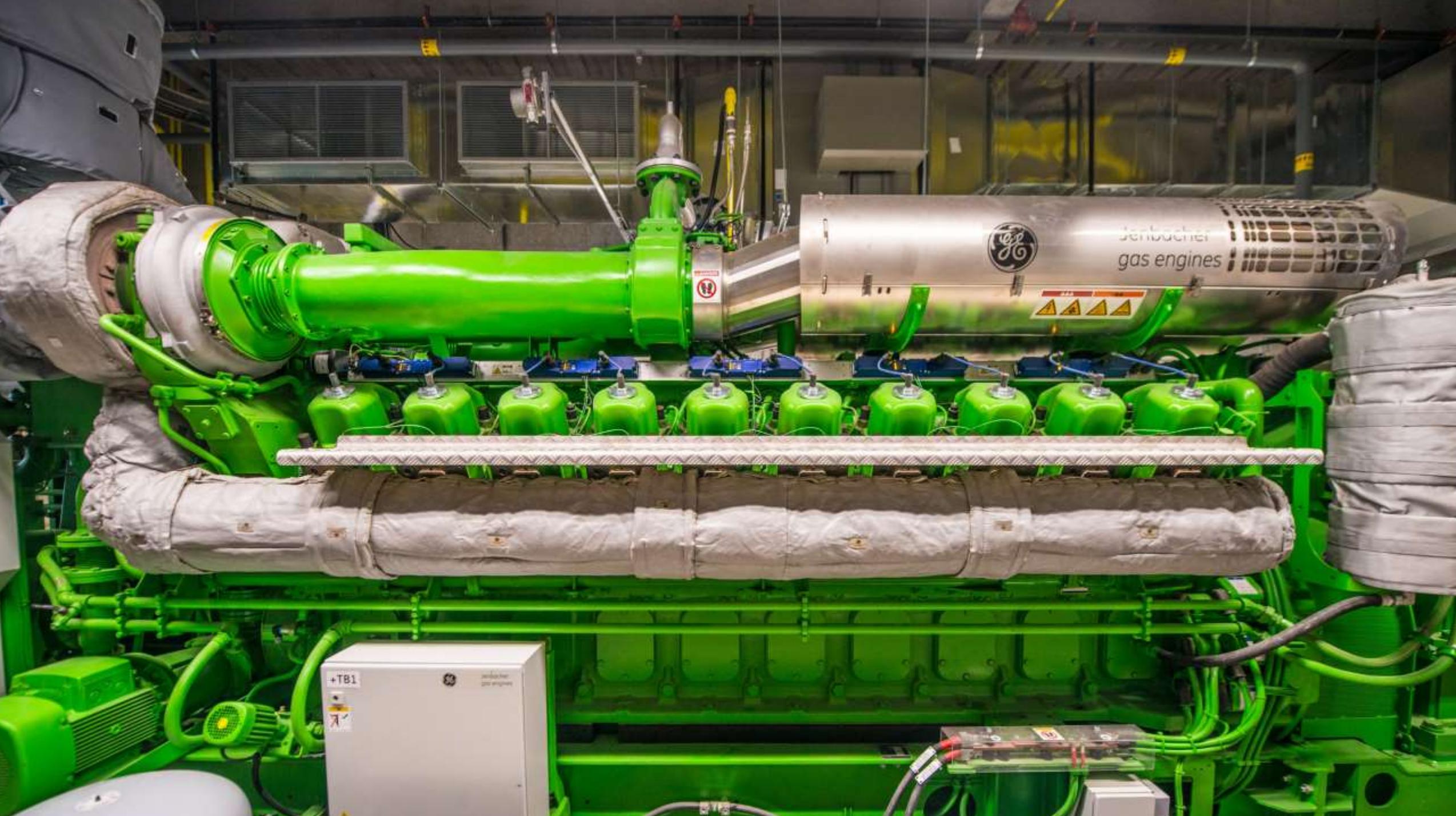


20-30%

CONTRIBUTION TO DE THERMAL DEMAND

~90%

DE SYSTEM THERMAL EFFICIENCY WITH CHP



Jenbacher
gas engines

+T81



Jenbacher
gas engines

Getting from there to here...

THIS SHOULD BE EASY



Design Challenges











RETURN TEMPERATURE CHALLENGE

STANDARD CHP RETURN = 58 °C

ENGINE MAX RETURN = 71 °C

ENMAX CHP RETURN = 67 °C

Construction Challenges





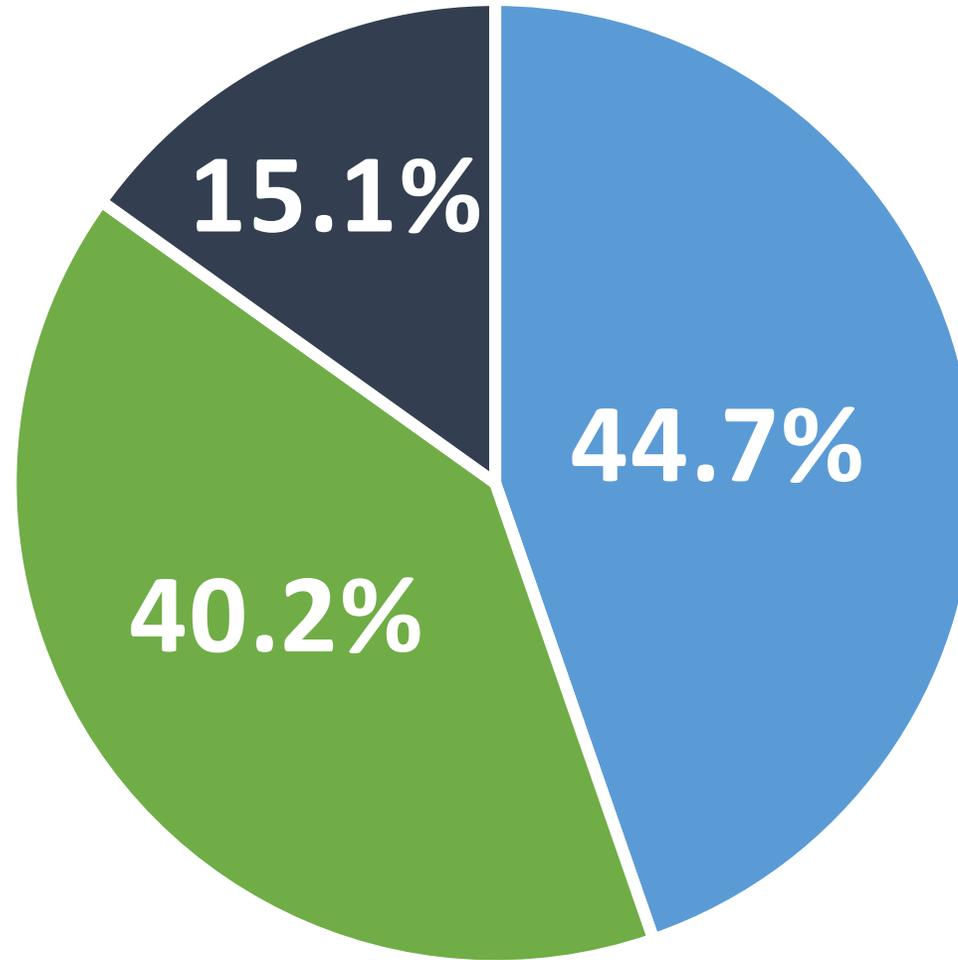


Results

ELECTRICAL CAPACITY = 3,333 kW_e

THERMAL CAPACITY = 2,999 kW_t

EFFICIENCY



■ Electrical ■ Thermal ■ Losses

Credits



Questions?

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